

description of specific embodiments thereof, especially when taken in conjunction with the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a process diagram of a first method embodiment of the present invention that begins with 100% rice flour; and

Fig. 2 is a process diagram of a second method embodiment of the present invention that begins with equal parts of rice flour and rice syrup, or equal parts of rice flour and honey.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Fig. 1 illustrates a food processing embodiment of the present invention, referred to herein by the reference numeral 100. A starting portion of rice flour 102 is mixed with a slurry 104 of water and amylase enzymes. For example, the rice flour, water, and enzymes are preferably mixed in a ratio of 100:20:1, by weight. These are extruded in a step 106 under time-and-temperature conditions 108, e.g., for 3-10 seconds at 35°C to 60°C. The high temperature, pressure, and shear conditions that exist during extrusion partially gelatinize the rice flour and cleave at least 20% of the terminal amylase groups from the amylopectin molecules. Ordinarily, high water activity levels of 55%-70% are needed to get good enzyme activity. But here the water content is preferably on the order of 10%-20%, by weight. A resulting

paste has a texture and color similar to a solid or semi-solid fat, e.g., shortening like CRISCO, and has a bland, neutral taste. A commercial food product 110 results by adding a container packaging 112. The typical melting point
5 of the fat-replacement product is about 120°F.

In particular, the use of 1% alpha-amylase enzymes is preferred in all embodiments of the present invention. However, other amylase enzyme types and other enzymes can nevertheless be used to advantage and produce useful food
10 products contemplated by the present invention.

Fig. 2 illustrates another food processing embodiment of the present invention, referred to herein by the reference numeral 200. A starting portion of rice flour 202 is mixed with a sweetener 204, e.g., rice syrup, honey, corn syrup, or
15 other source of sugars. A portion of water 206 may be added to adjust the final texture of the product. A portion 208 of amylase enzymes are mixed in to promote depolymerization during extrusion, e.g., for a gelatin formation. For example, the rice flour, sweetener, and enzymes are
20 preferably mixed in a ratio of 50:50:1, by weight. The amount of water to add is empirically determined. These are then extruded in a step 210 under time-and-temperature conditions 212, e.g., for 3-10 seconds at 85°C to 130°C. If a pH adjustment is needed for the final food product, a second
25 extrusion step 214 is used with time-and-temperature conditions 216, e.g., for 3-10 seconds at 85°C to 130°C. Step 216 inactivates the amylase enzymes. A commercial food product 218 is made ready to distribute to users by adding a container packaging 220. In process 200, the portion of
30 sweetener 204 can be varied 1%-55%, by weight, and still provide good results.

The extruders used can have as few as two zones, to six or more zones. Holding tubes may be placed between a

plurality of extruders. Browning of the food products can be reduced or eliminated by cooling the ends of the extruders.

In general, method embodiments of the present invention curtail the amount of fat in finished food products by

5 including granular rice flour hydrolysates as a fat replacement having a dextrose equivalent (DE) of about 5-90. Such hydrolysates are prepared by cleaving at least 20% of amylose groups, preparing a slurry of a granular rice flour containing at least about 20% weight amylopectin and 5%-25%
10 weight water, heating the mass in the presence of amylase enzyme under conditions sufficient to cleave at least about 20% of the terminal amylose groups from the amylopectin molecules, and then cooling to form a product that has the approximate viscosity and texture of solid fat.

15 Preferably, the initial rice flour ingredient here is a granular unmodified waxy rice flour. The water-enzyme slurry can be varied about 70%-90% weight of the rice flour.

Preferably, the slurry is heated under conditions sufficient to cleave at least 40% of the terminal amylose groups.

20 Alternatively, the slurry is heated at or above atmospheric pressure and at a temperature of about 50°-100°C. Different product textures can be achieved by heating the slurry at or above autogenous pressure and at a temperature of about 70°-250°C.

25 Fats and oils are widely used in food, and there is no chemical difference between them. Fats are solid at room temperature while oils are liquid. Fats, carbohydrates and proteins constitute the three major classifications of food. Fats contain more than double the number of calories per unit
30 weight of carbohydrates or proteins. Fats in the diet are linked with heart disease, cancer, and a wide range of undesirable effects in humans.

However, the taste, mouthfeel, and other organoleptic properties of fat in food are so seductive that it is not an